*[Beef 2016 'Profitable Technologies, Teagasc, Grange, Dunsany, Ireland, Open Day July 2016, p52-55]*

# Grass silage for beef production

Joe Patton

*Teagasc, Grange Animal & Grassland Research and Innovation Centre, Dunsany, Co. Meath.*

## Summary

- Farms feeding multiple classes of stock over the winter period will likely need silage at various quality levels. A specific farm plan will help to achieve this.
- Soil pH, phosphorus and potassium deficiencies are major limitations to improving silage yield and quality targets. Develop a fertiliser application plan based on soil test results.
- Reseeded swards, tight grazing pre-closing, adequate N application, and cutting at the correct grass growth stage are key elements to maximising silage quality for a given DM yield.

## Introduction

Grass silage is an important part of the annual feed budget for beef production systems, accounting for up to 25-30% of total feed dry matter (DM) consumed on a typical drystock farm. As a standalone feed it can be quite expensive to produce (€125 to €160 per tonne DM), however when taken as part of an integrated grazing system, well-managed grass silage is cost-competitive relative to concentrates and alternative forages. The principal management challenge for beef producers is to balance the dual objectives of having adequate yield of silage DM while meeting feed quality targets for good animal performance.

## Defining targets for grass silage production

The three key elements to cost-effective grass silage production for beef cattle are:

1. High grass DM yields for first-cut and subsequent cuts, with high total annual grass yield (>14.0 tonnes DM/ha). Guideline yields are 4.8 t DM/ha and up to 6.2 t DM/ha for silage harvested in mid-May and early June, respectively.
2. Appropriate feed quality for the class of livestock to be fed. This is best measured as digestibility of the crop DM (DMD); protein content is also important and is positively associated with DMD and nitrogen fertiliser use. Dry suckler cows can be adequately fed on 67-68% DMD grass silage. For growing/finishing cattle and suckler cows in early lactation, the target is to have silage at 72-74% DMD or higher.
3. Clean, stable, feed with high intake characteristics. This is achieved through good fermentation and can be assessed from silage pH (3.9 to 4.2 for un-wilted crops for clamp silage, 4.5 for bales), ammonia (target less than 9%), and lactic acid (target over 8%) content.

Grass DM yield at harvest is the single most important factor determining the cost per tonne of silage in the pit. Fixed costs per hectare such as land charges and contractor fees are diluted over the extra tonnage, and so too are some of the variable costs associated with fertiliser and slurry applications. This, coupled with the objective of building adequate feed reserves for the winter, has meant that silage quantity rather than quality is often given priority on beef farms. National surveys of first-cut grass silage analysis results for Teagasc beef clients in 2014-2015 bear this out, with an average DMD of 65%, and a range from 58% to 77%. But is there any real value to targeting better silage quality for most beef herds? And is it worth losing DM yield to achieve it?

## The benefits of quality silage in beef production systems

The potential benefit of improving grass silage DMD depends on the mix of livestock on the farm over the winter period. While 'national average' silage is suitable only for dry suckler cows requiring zero body condition score gain, farm systems requiring higher animal performance stand to benefit from raising silage DMD by at least 6-7 percentage points above this level. This was demonstrated in a

study conducted at Teagasc Grange (Table 1) which measured intake and live weight gains for cattle offered silages with a range of DMD values. Results showed that growing cattle fed high quality silage (75% DMD) gained approximately 0.3 kg more live weight per day compared to those fed silage at national average DMD (65%). The extra performance was due to a combination of higher daily DM intake (DMI) and greater feed energy value per kg of silage DM.

**Table1.** Effect of silage quality on silage intake and daily weight gain in growing cattle.

| | First cut silage quality | | | |
|---|---|---|---|---|
| **DMD %** | **75** | **70** | **65** | **60** |
| Harvest date | 20 May | 2 June | 15 June | 28 June |
| Silage yield (t DM per ha) | 4.8 | 6.0 | 7.0 | 7.7 |
| Dry matter intake (DMI) (kg/day) | 9.0 | 8.3 | 7.6 | 7.0 |
| Liveweight gain (kg/day) | 0.83 | 0.66 | 0.49 | 0.31 |
| Carcass gain (kg/day) | 0.51 | 0.39 | 0.27 | 0.15 |
| Feed efficiency (DMI/kg carcass gain) | 17.6 | 21.1 | 28.1 | 46.7 |

The consequence of feeding the higher quality (75% vs 65% DMD) silage at farm level would include approximately 40 kg extra live weight gain over a 150-day housing period, a 2.0 to 2.5 kg reduction in daily concentrate intake for similar daily gain, and/or a shorter final finishing period. Interestingly, the efficiency of carcass gain per kg of DMI was also significantly improved with higher DMD silage, delivering potential environmental as well as economic advantages.

## Finding a balance between yield and quality

Given the significant risk of excess body condition gain for late gestation suckler cows fed high quality silage, it is clear that beef farms with a mix of livestock types (e.g. dry suckler cows, weanlings and finishing cattle) will also have a requirement of silages of varying DMD levels. In the study outlined high DMD silage was produced by cutting in mid-May when grass had high leaf content, while lower DMD silage was produced by delaying cutting into June when grass had become stemmy after seed head emergence. Therefore, while the objectives of good DM yield and excellent preservation remain consistent, target DMD should dictate the optimum stage of grass maturity at which to harvest the crop. The reality for beef farms feeding varied livestock types over the winter is that no single cutting date is suitable for all stock. A simple silage management plan that takes this into account can be developed for the farm, using the following steps:

1- Define the highest quality silage required on the farm first.
2- Estimate the total quantity of this silage needed.
3- Calculate the area of first and subsequent cuts needed to produce this silage.
4- Mark on the farm map and set targets for spring grazing, fertiliser, cutting date.
5- Manage the remaining area to produce silage of standard quality.

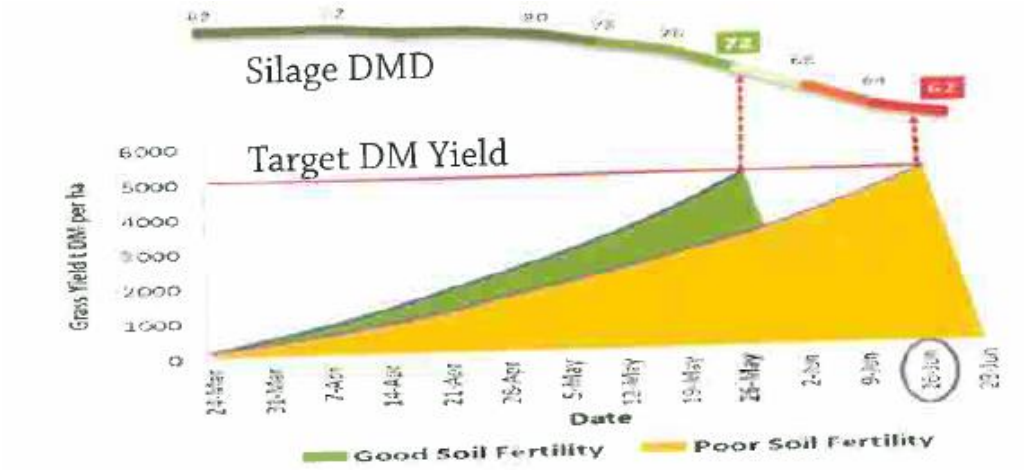

**Figure 1.** Effect of soil fertility status on first-cut harvest date and silage DMD.
Furthermore, the sward on high fertility soil has 2-3 weeks extra recovery time after first-cut, resulting in improved second-cut silage yield and quality, and perhaps additional autumn grazing. Management decisions around silage yield should therefore be made on the basis of meeting DMD targets and improving annual grass tonnage per hectare, rather than focussing solely on the bulk of an individual cut.

## Management guidelines for cost-effective grass silage production

*Grazing in spring:* To achieve good quality silage in May, it is essential to graze to <4cm residual in February/March before applying fertilizer for silage. A similar effect can be achieved by tight grazing with young stock in late autumn. However, swards with yellow/dead material must be grazed off otherwise silage DMD may be reduced by up to 6-7 percentage points. Silage ground re-seeded the previous autumn should have been grazed at least twice before closing for silage.

*Fertiliser and lime:* The first step to improving silage yield and quality on most beef farms is to take soil samples and develop a field-by-field fertiliser plan based on the P, K and lime requirements (Table 2). Treat P and K separately as silage fields may be adequate for one nutrient but be lacking in the other. Reduce the N application rate by 20-25 kg per ha for old pastures or if the field was grazed rather than cut the previous year. Soil pH is often the first limiting factor for silage yield so ensure the target pH 6.3 is met. Apply lime in summer/autumn but avoid spreading for 3-4 months before cutting as it may adversely affect the fermentation process.

**Table 2.** Fertiliser nutrient application rates guidelines for first cut silage (kg/ha)

| **Soil Index** | **1** | **2** | **3** | **4** |
|---|---|---|---|---|
| P required | 40 | 30 | 20 | 0 |
| K required | 175 | 155 | 125 | 0 |
| N required | 125 | | | |
| Sulphur required | 12-14 (10% of N applied) | | | |

*Timing of silage cutting date:* Swards should be managed such that good grass DM yields (4.8 to 5.0 t DM) are present at or before grass heading date. A decision can then be made whether to harvest at high DMD or delay beyond heading date to increase yield (to >6.0 t DM per ha) of maintenance-level feed. Timely fertiliser N application and closing is important in this regard. A useful guide for fertiliser N is that grass uses 2.5 kg N (2.0 units) per day on average, so final N should be applied approximately 50 days before planned cutting date. However, the crop may still be safely harvested sooner depending on nitrate and sugar levels. If weather conditions are otherwise suitable, test the grass crop rather than sticking rigidly to the '2-unit rule'. Wilting the crop to >28% DM aids preservation if nitrate readings are high.

*Achieving good preservation:* Good preservation occurs when lactic acid bacteria present on the grass crop ferment available sugars to lactic acid. This causes a decline in pH which preserves the feed value of the stored silage. High available sugars, low buffering capacity and air-free (anaerobic) conditions are necessary for achieving good preservation. Grass sugars content is more critical to good preservation than nitrate readings. Ideal conditions for high sugars are ryegrass swards, dry sunny weather, cool nights and mowing in the afternoon. Add a sugar source (e.g. molasses) if the opportunity for cutting is there, but Brix (sugar) readings are low. Under good ensiling conditions, there is no clear benefit to using additives. Adding inoculants (bacteria, enzymes) will not significantly improve feed value if the standing grass crop is of poor quality. Where wilting is likely to be of benefit, reaching the target DM of 28-32% is a function of swath type and duration of drying. There is no animal performance advantage to wilting beyond 32% DM.

*Reseeding:* Productive silage ground must have perennial ryegrass swards. Old permanent pasture is less responsive to fertiliser nutrients for first-cut crops, leading to delayed harvest and poor DMD. Lower sugar content makes preservation more difficult. The decision to reseed should be based on sward composition and performance. A rule of thumb is that silage ground should be reseeded every 8-10 years (5-6 years for multiple cut systems). Many farms do not reach this target, especially if

silage ground is on short-term lease. Reseeding is unlikely to be successful if soil fertility and post-emergence management to promote tillering and weed control are lacking.
*Managing DM losses:* Reducing DM losses at ensiling and feed-out is often overlooked as a potential means improving efficiency. These losses range from 15-30% of standing crop DM. This can add significantly to the cost per tonne of silage fed and increase the requirement for purchased feed. The main sources of DM loss include poor aerobic stability (poor fermentation), failure to seal and maintain pits/bales fully, excessive exposure to air across the silage pit face, and waste at the feed barrier.

**The above article was adapted and reproduced courtesy of Teagasc.**

**Simon Marsh, Principal Lecturer – Beef Cattle Specialist, Harper Adams University.**